Small Business Innovation Research/Small Business Tech Transfer

Controlled-Release Silver Biocide Device, Phase I

Completed Technology Project (2018 - 2019)

Project Introduction

Silver and its compounds are of significant appeal for long-duration space missions, as they are capable of destroying or inhibiting the growth of microorganisms including bacteria, viruses, algae, molds and yeast, while exhibiting low toxicity to humans. The general pharmacological properties of silver are based upon the affinity of silver ion for biologically important moieties such as sulfhydryl, amino, imidazole, carboxyl and phosphate groups, and these multiple mechanisms are primarily responsible for its antimicrobial activity. Silver can impact a cell through multiple biochemical pathways, making it difficult for a cell to develop resistance to it, and it can be precisely and efficiently delivered using controlled-release technology.

An engineering approach is detailed that optimizes the epidemiological features of silver compounds in conjunction with the chemical and mechanical features desirable for long-duration space missions. Phase I builds upon three distinct engineering approaches to produce flow-through silver biocide delivery devices based on controlled-release designs that have multiple decades of success in process industrial applications. Phase II will consist of design optimization and extensive parametric testing to support on-site NASA tests and long-duration flight requirements. Phase II will also investigate a regenerate approach to maintaining device activity over multi-year operational lifetimes. The long-term results and benefits to the manned space program are high antimicrobial effectiveness, low toxicity, simple integration and operation into advanced life support systems, maximum operational life, and superior mass/volume efficiency compared to any other possible approach.

Anticipated Benefits

This technology is expected to be baselined for all future advanced space missions including Lunar and Mars bases, and vehicles required for transport to those destinations. The option to retro-fit International Space Station with silver-based biocide delivery units is possible.

The proposed technology has extensive commercial potential in the $3.2B global water treatment market for biocides and includes applications in aquaculture, ultrapure water, industrial process water, emergency and outdoor markets The low manufacturing cost of the proposed device will result in significant market potential for this NASA-sponsored technology.

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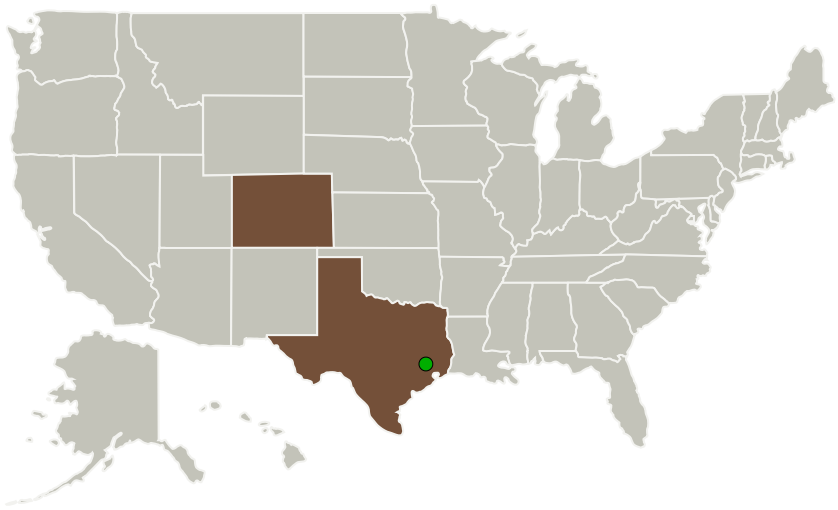
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Environmental and Life Support Technology, Inc.	Lead Organization	Industry	Parker, Colorado
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations	
Colorado	Texas

Project Transitions

July 2018: Project Start

February 2019: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140989)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Environmental and Life Support Technology, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

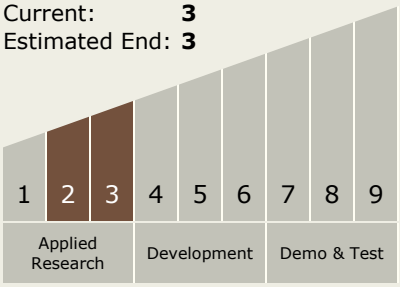
Carlos Torrez

Principal Investigator:

Clifford Jolly

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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Images

Briefing Chart Image
Controlled-Release Silver Biocide Device, Phase I
(https://techport.nasa.gov/image/127565)

Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.1 Environmental Control & Life Support Systems (ECLSS) and Habitation Systems
    - TX06.1.2 Water Recovery and Management

Target Destinations

Earth, The Moon, Mars

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Final Summary Chart Image
Controlled-Release Silver Biocide Device, Phase I
(https://techport.nasa.gov/image/136332)